FIG. 1

FIG. 2

WAVELENGTH DIVISION DEMULTIPLEXER   256×256 OPTICAL SWITCH   WAVELENGTH CONVERTER   WAVELENGTH DIVISION MULTIPLEXER

$\lambda_1 - \lambda_{33}$ INTER-OFFICE (6) $\lambda_1 - \lambda_{33}$ INTRA-OFFICE $\lambda_1 - \lambda_{33}$

$\lambda_1 - \lambda_{32}$ (6) INTER-OFFICE $\lambda_1 - \lambda_{32}$ INTRA-OFFICE $\lambda_1 - \lambda_{32}$

λ_1 ... λ_{32}

(a) WAVELENGTH CONVERTING TYPE

WAVELENGTH DIVISION MULTIPLEXER   8×8 OPTICAL SWITCH   WAVELENGTH DIVISION DEMULTIPLEXER

$\lambda_1 - \lambda_{32}$ (6) INTER-OFFICE $\lambda_1 - \lambda_{32}$ $\lambda_1 - \lambda_{32}$ INTRA-OFFICE $\lambda_1 - \lambda_{32}$

λ_1 λ_{32} (32)

$\lambda_1 - \lambda_{32}$ INTER-OFFICE (6) $\lambda_1 - \lambda_{32}$ $\lambda_1 - \lambda_{32}$ INTRA-OFFICE $\lambda_1 - \lambda_{32}$

(b) WAVELENGTH FIXING TYPE

※ INTER-OFFICE LINK NUMBER: 6

※ INTRA-OFFICE LINK NUMBER: 2

※ WAVELENGTH MULTIPLEXED NUMBER: 32

FIG. 3

(a) WAVELENGTH CONVERTING TYPE OPTICAL PATH NETWORK

$\lambda 1 - \lambda 32$

OPTICAL XC

1

64

1

64
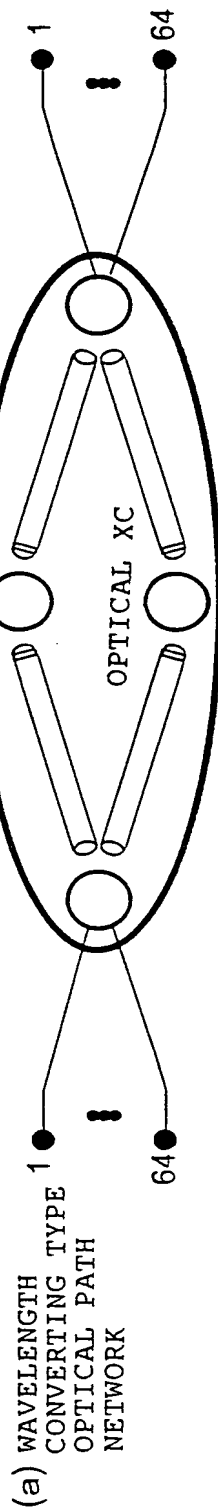
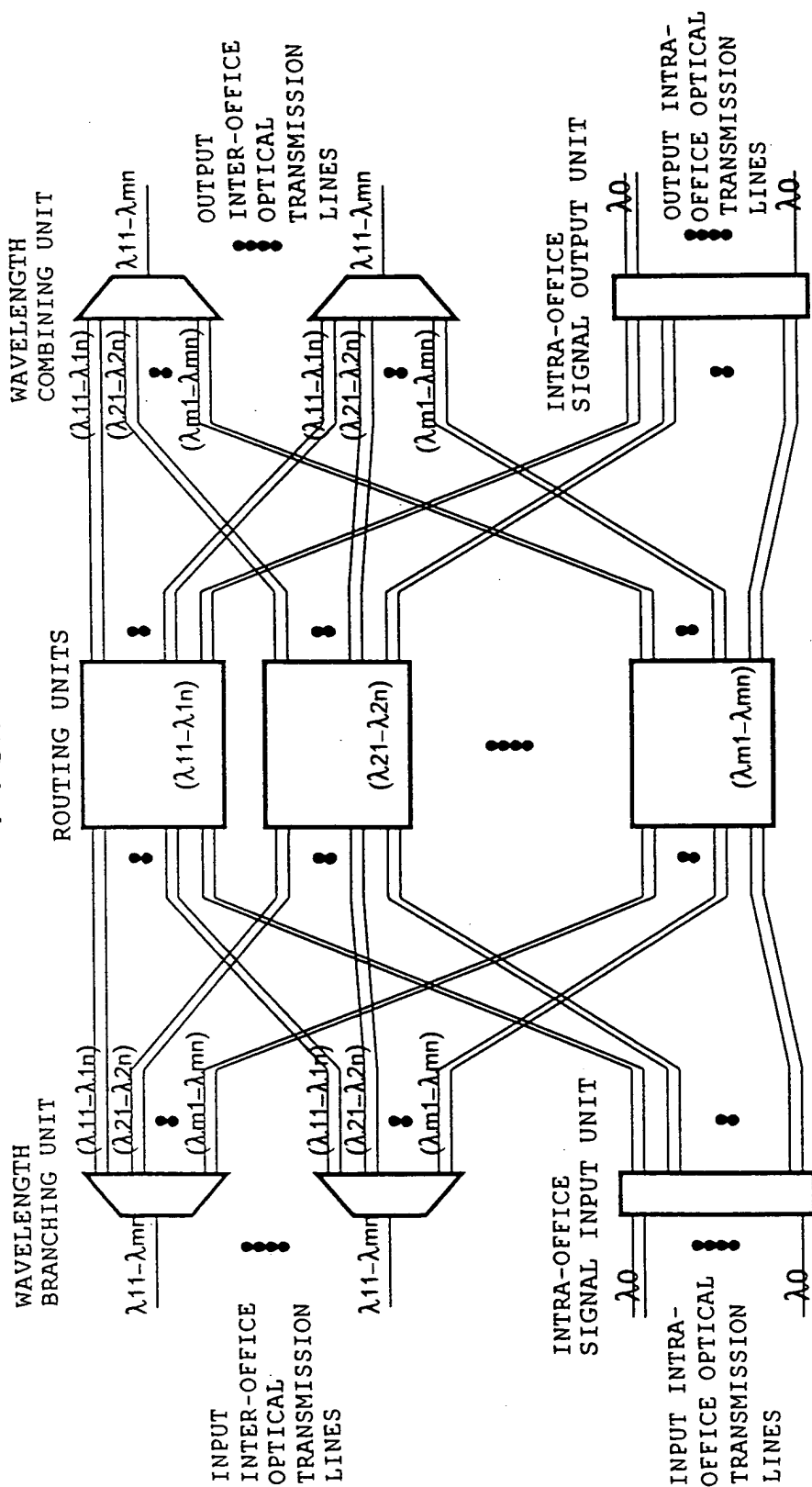※ THE WAVELENGTHS ARE ALLOCATED IN THE LINK-BY-LINK BASIS BETWEEN THE SENDER AND RECEIVER NODES WITH RESPECT TO ONE OPTICAL PATH IN THE NETWORK.

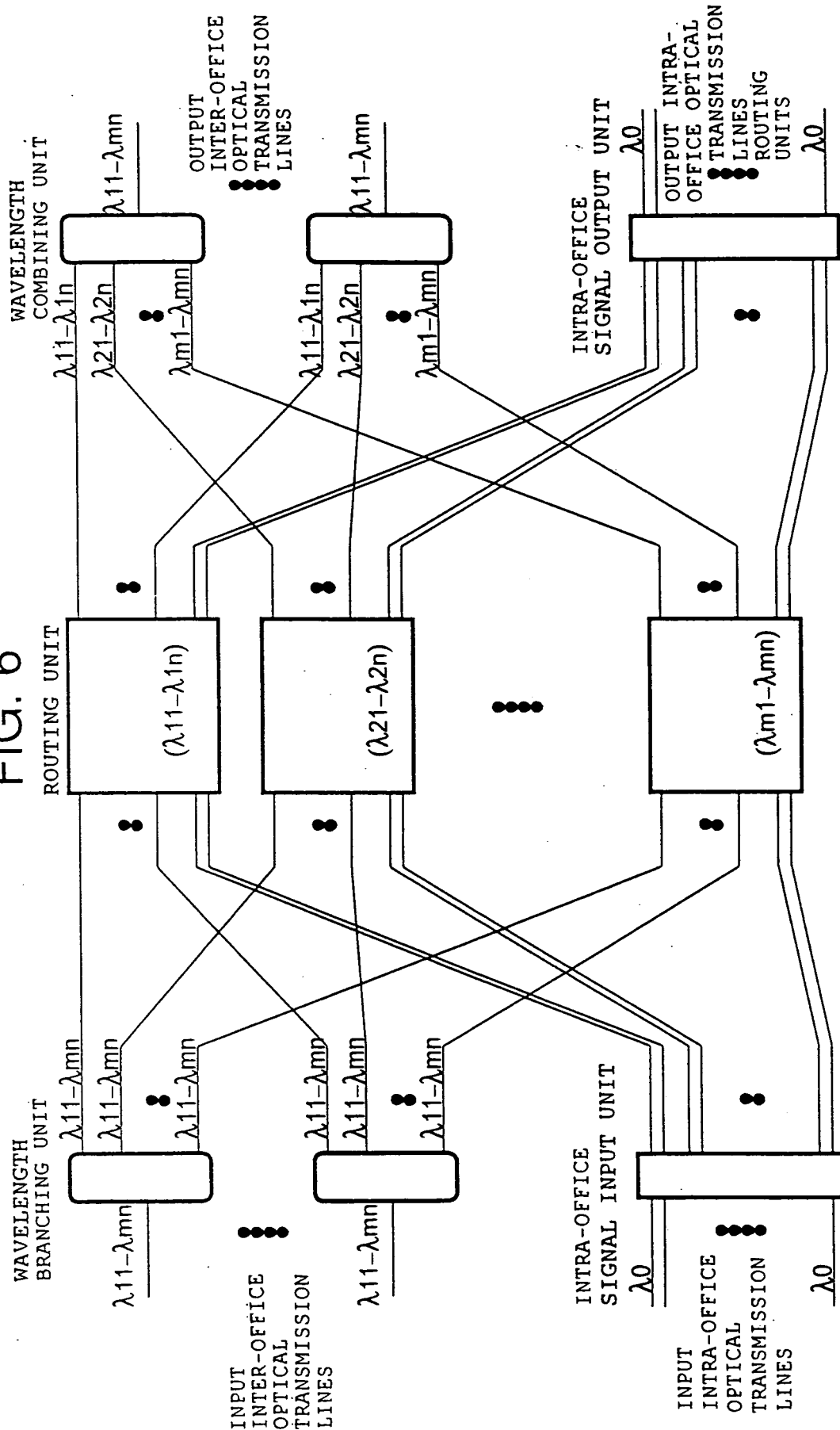(b) WAVELENGTH FIXING TYPE OPTICAL PATH NETWORK

$\lambda 1$

(32)

$\lambda 32$

OPTICAL XC

OPTICAL XC

2

2

2

2

1

64

1

64
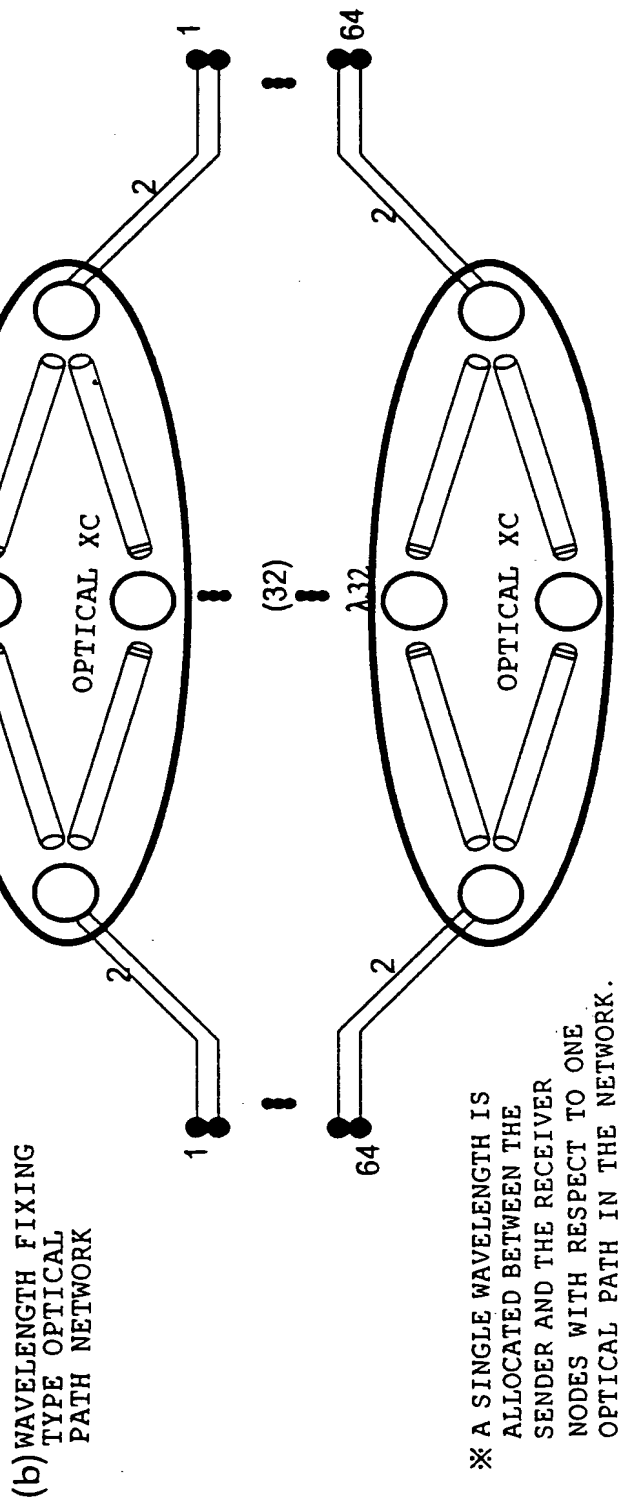
※ A SINGLE WAVELENGTH IS ALLOCATED BETWEEN THE SENDER AND THE RECEIVER NODES WITH RESPECT TO ONE OPTICAL PATH IN THE NETWORK.

FIG. 4

WAVELENGTH COMBINING UNIT

ROUTING UNITS

WAVELENGTH BRANCHING UNIT

OUTPUT INTER-OFFICE OPTICAL TRANSMISSION LINES

$\lambda_{11}-\lambda_{mn}$

$(\lambda_{11}-\lambda_{1n})$
$(\lambda_{21}-\lambda_{2n})$
$(\lambda_{m1}-\lambda_{mn})$

$\lambda_{11}-\lambda_{mn}$

$(\lambda_{11}-\lambda_{1n})$
$(\lambda_{21}-\lambda_{2n})$
$(\lambda_{m1}-\lambda_{mn})$

$(\lambda_{11}-\lambda_{1n})$

$(\lambda_{21}-\lambda_{2n})$

$(\lambda_{m1}-\lambda_{mn})$

INTRA-OFFICE SIGNAL OUTPUT UNIT

λ_0

OUTPUT INTRA-OFFICE OPTICAL TRANSMISSION LINES

λ_0

INPUT INTER-OFFICE OPTICAL TRANSMISSION LINES

$\lambda_{11}-\lambda_{mn}$

$(\lambda_{11}-\lambda_{1n})$
$(\lambda_{21}-\lambda_{2n})$
$(\lambda_{m1}-\lambda_{mn})$

$\lambda_{11}-\lambda_{mn}$

$(\lambda_{11}-\lambda_{1n})$
$(\lambda_{21}-\lambda_{2n})$
$(\lambda_{m1}-\lambda_{mn})$

INTRA-OFFICE SIGNAL INPUT UNIT

λ_0

INPUT INTRA-OFFICE OPTICAL TRANSMISSION LINES

λ_0

※ SUBDIVIDED INTO "M" PIECES OF ROUTING UNITS IN UNIT OF "N" WAVELENGTHS
※ PROVIDED WITH WAVELENGTH CONVERTER EACH OF THE RESPECTIVE

FIG. 5

WAVELENGTH
COMBINING UNIT

WAVELENGTH
BRANCHING UNIT

ROUTING UNIT

INTRA-OFFICE
SIGNAL OUTPUT UNIT

INTRA-OFFICE
SIGNAL INPUT UNIT

$\lambda 11-\lambda 1n$
$\lambda 21-\lambda 2n$
$\lambda m1-\lambda mn$

$\lambda 11-\lambda mn$

OUTPUT
INTER-OFFICE
OPTICAL
TRANSMISSION
LINES

OUTPUT INTRA-
OFFICE OPTICAL
TRANSMISSION
LINES ROUTING
UNITS

$(\lambda 11-\lambda 1n)$

$(\lambda 21-\lambda 2n)$

$(\lambda m1-\lambda mn)$

INPUT
INTER-OFFICE
OPTICAL
TRANSMISSION
LINES

INPUT INTRA-
OFFICE
OPTICAL
TRANSMISSION
LINES

$\lambda 11-\lambda mn$

※ SUBDIVIDED INTO "M" PIECES OF ROUTING UNITS
  IN UNIT OF "N" WAVELENGTHS
※ PROVIDED WITH WAVELENGTH CONVERTER EACH OF THE RESPECTIVE

FIG. 6

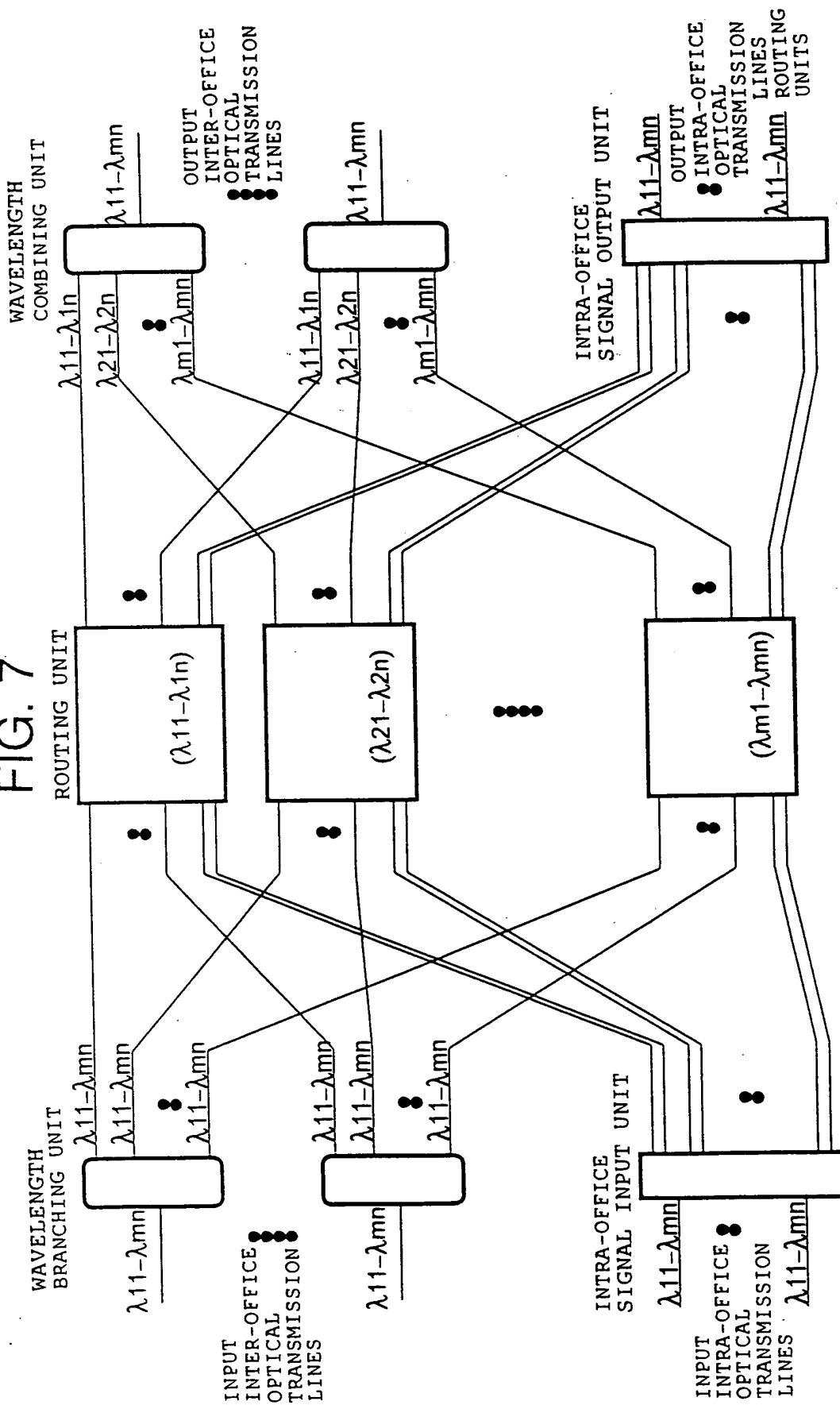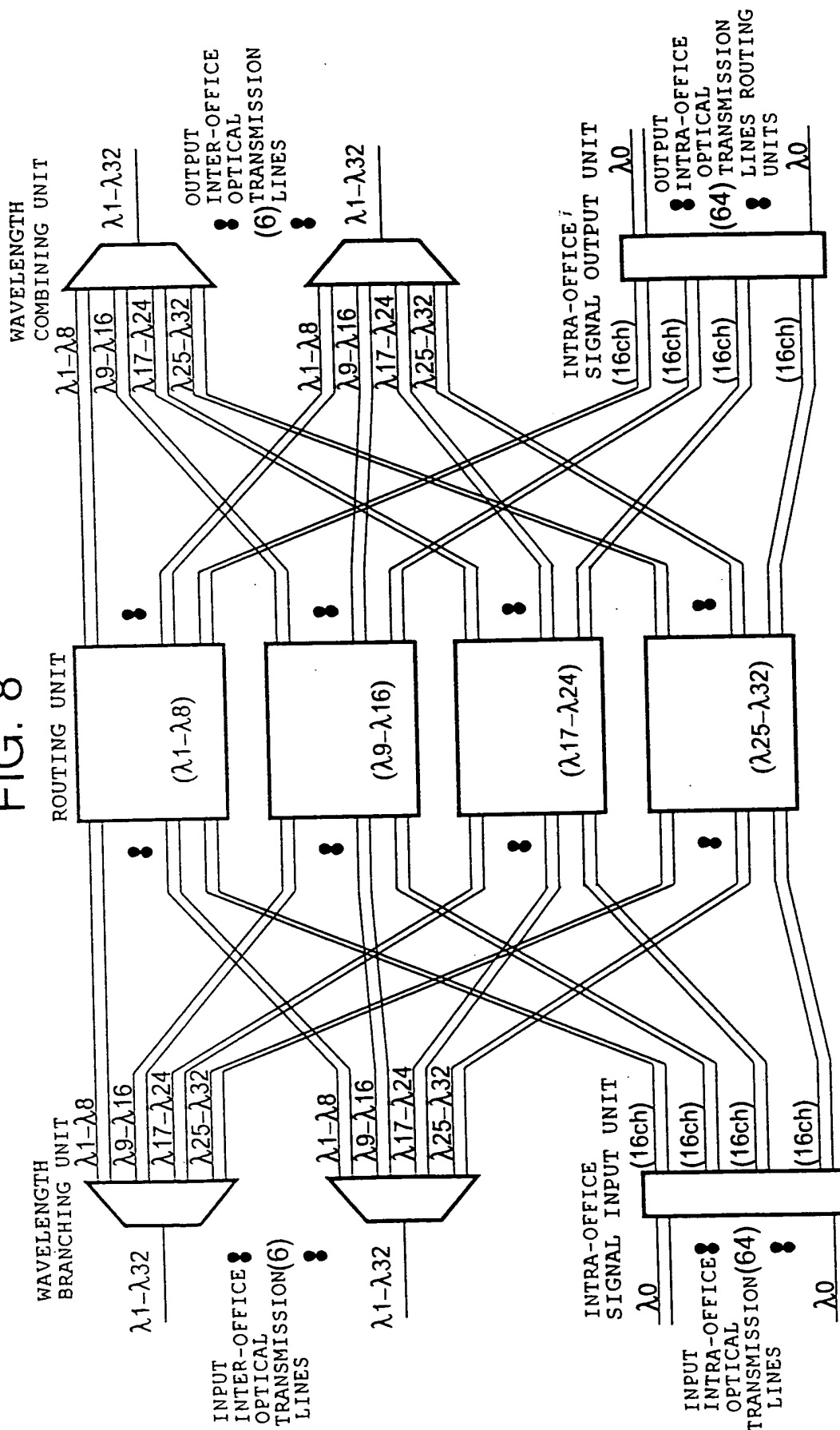WAVELENGTH COMBINING UNIT

$\lambda 11-\lambda 1n$
$\lambda 21-\lambda 2n$
$\lambda m1-\lambda mn$

$\lambda 11-\lambda mn$

OUTPUT INTER-OFFICE OPTICAL TRANSMISSION LINES

$\lambda 11-\lambda 1n$
$\lambda 21-\lambda 2n$
$\lambda m1-\lambda mn$

$\lambda 11-\lambda mn$

INTRA-OFFICE SIGNAL OUTPUT UNIT

$\lambda 0$

OUTPUT INTRA-OFFICE OPTICAL TRANSMISSION LINES

$\lambda 0$

ROUTING UNITS

ROUTING UNIT

$(\lambda 11-\lambda 1n)$

$(\lambda 21-\lambda 2n)$

$(\lambda m1-\lambda mn)$

WAVELENGTH BRANCHING UNIT

$\lambda 11-\lambda mn$
$\lambda 11-\lambda mn$
$\lambda 11-\lambda mn$

$\lambda 11-\lambda mn$

$\lambda 11-\lambda mn$
$\lambda 11-\lambda mn$
$\lambda 11-\lambda mn$

$\lambda 11-\lambda mn$

INTRA-OFFICE SIGNAL INPUT UNIT

$\lambda 0$

INPUT INTER-OFFICE OPTICAL TRANSMISSION LINES

INPUT INTRA-OFFICE OPTICAL TRANSMISSION LINES

$\lambda 0$

※ SUBDIVIDED INTO "M" PIECES OF ROUTING UNITS
 IN UNIT OF "N" WAVELENGTHS
※ PROVIDED WITH WAVELENGTH CONVERTER EACH OF THE RESPECTIVE

FIG. 7

WAVELENGTH COMBINING UNIT

WAVELENGTH BRANCHING UNIT

ROUTING UNIT

$(\lambda 11 - \lambda 1n)$

$(\lambda 21 - \lambda 2n)$

$(\lambda m1 - \lambda mn)$

INTRA-OFFICE SIGNAL OUTPUT UNIT

INTRA-OFFICE SIGNAL INPUT UNIT

$\lambda 11 - \lambda mn$

$\lambda 11 - \lambda 1n$

$\lambda 21 - \lambda 2n$

$\lambda m1 - \lambda mn$

OUTPUT INTER-OFFICE OPTICAL TRANSMISSION LINES

OUTPUT INTRA-OFFICE OPTICAL TRANSMISSION LINES ROUTING UNITS

INPUT INTER-OFFICE OPTICAL TRANSMISSION LINES

INPUT INTRA-OFFICE OPTICAL TRANSMISSION LINES

※ SUBDIVIDED INTO "M" PIECES OF ROUTING UNITS
  IN UNIT OF "N" WAVELENGTHS
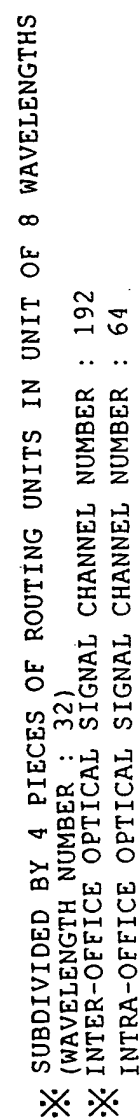※ PROVIDED WITH WAVELENGTH CONVERTER EACH OF THE RESPECTIVE

FIG. 8

※ SUBDIVIDED BY 4 PIECES OF ROUTING UNITS IN UNIT OF 8 WAVELENGTHS
  (WAVELENGTH NUMBER : 32)
※ INTER-OFFICE OPTICAL SIGNAL CHANNEL NUMBER : 192
※ INTRA-OFFICE OPTICAL SIGNAL CHANNEL NUMBER : 64

FIG. 9
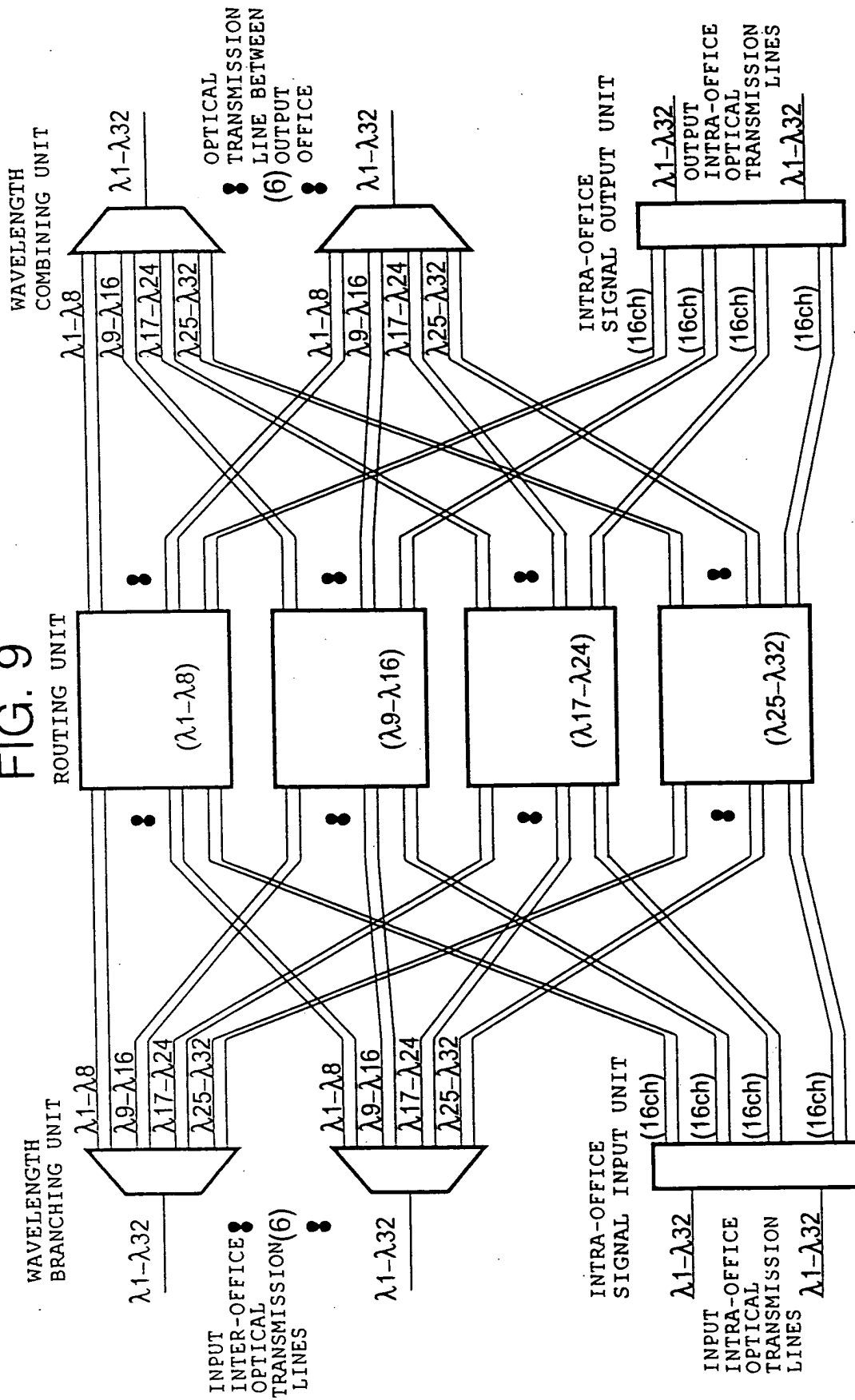
※ SUBDIVIDED BY 4 PIECES' OF ROUTING UNITS IN UNIT OF 8 WAVELENGTHS
  (WAVELENGTH NUMBER : 32)
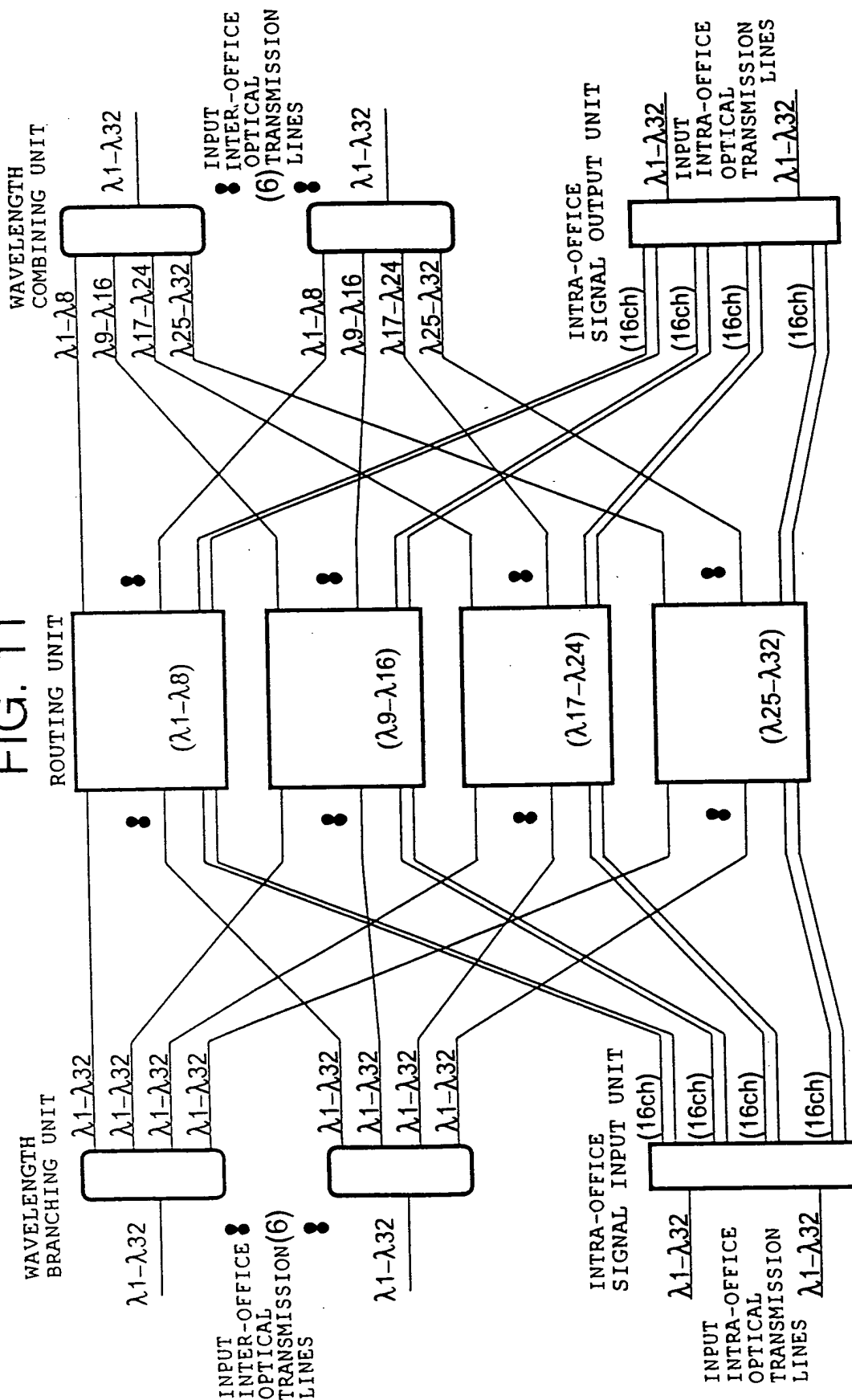※ INTER-OFFICE OPTICAL SIGNAL CHANNEL NUMBER : 192
※ INTRA-OFFICE OPTICAL SIGNAL CHANNEL NUMBER : 64

FIG. 10

WAVELENGTH COMBINING UNIT

WAVELENGTH BRANCHING UNIT

ROUTING UNIT

$(\lambda 1-\lambda 8)$

$(\lambda 9-\lambda 16)$

$(\lambda 17-\lambda 24)$

$(\lambda 25-\lambda 32)$

$\lambda 1-\lambda 8$ $\lambda 9-\lambda 16$ $\lambda 17-\lambda 24$ $\lambda 25-\lambda 32$

$\lambda 1-\lambda 32$

$\lambda 1-\lambda 32$

OUTPUT INTER-OFFICE OPTICAL (6) TRANSMISSION LINES

$\lambda 1-\lambda 32$ $\lambda 1-\lambda 32$ $\lambda 1-\lambda 32$ $\lambda 1-\lambda 32$

$\lambda 1-\lambda 32$

$\lambda 1-\lambda 32$ $\lambda 1-\lambda 32$ $\lambda 1-\lambda 32$ $\lambda 1-\lambda 32$

INPUT INTER-OFFICE OPTICAL TRANSMISSION(6) LINES

INTRA-OFFICE SIGNAL OUTPUT UNIT

$\lambda 0$ (16ch)

(16ch)

OUTPUT INTRA-OFFICE OPTICAL TRANSMISSION(64) LINES ROUTING UNITS

(16ch)

$\lambda 0$ (16ch)

INTRA-OFFICE SIGNAL INPUT UNIT

$\lambda 0$ (16ch)

INPUT INTRA-OFFICE OPTICAL TRANSMISSION(64) LINES

(16ch)

(16ch)

$\lambda 0$ (16ch)

※ SUBDIVIDED BY 4 PIECES OF ROUTING UNITS IN UNIT OF 8 WAVELENGTHS
   (WAVELENGTH NUMBER : 32)
※ INTER-OFFICE OPTICAL SIGNAL CHANNEL NUMBER : 192
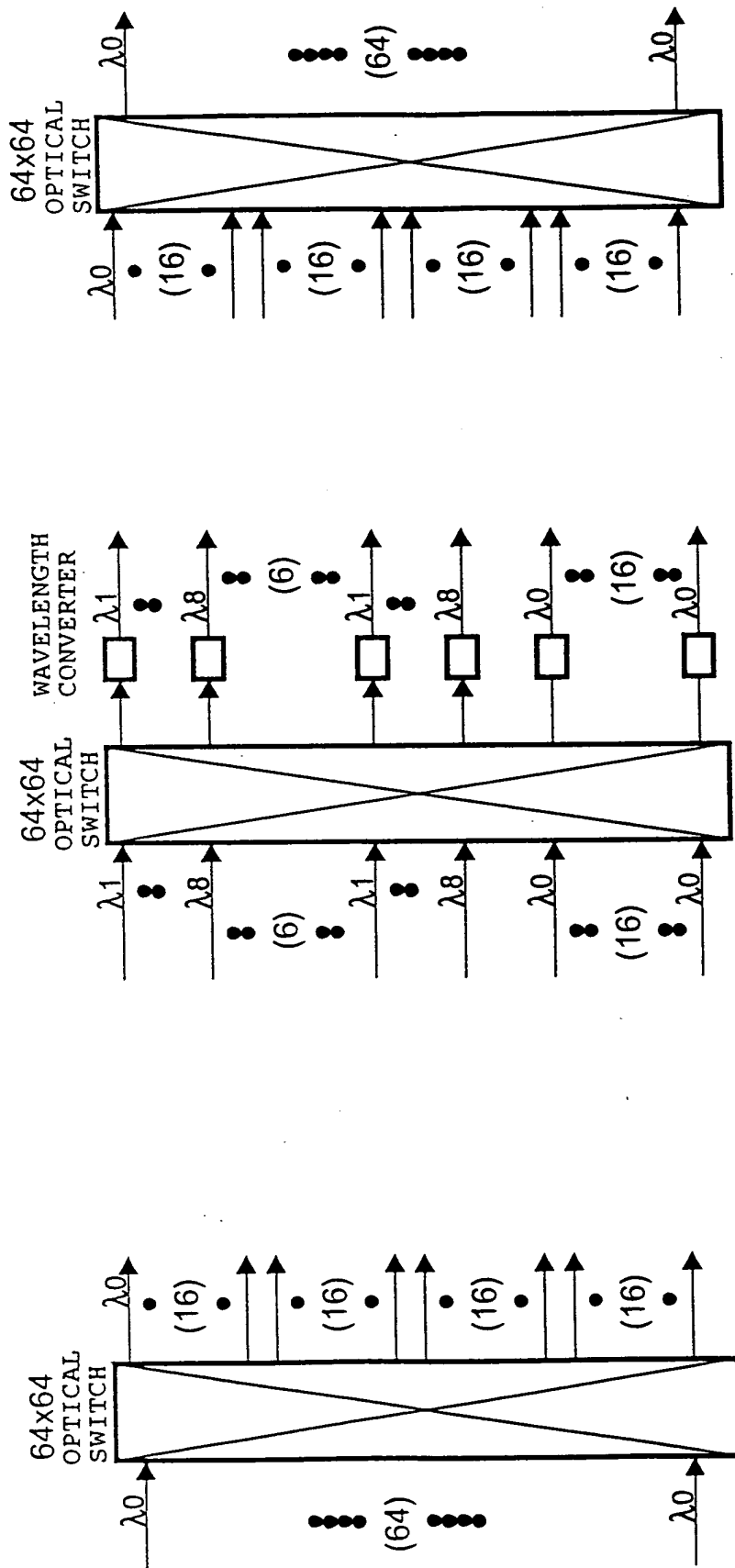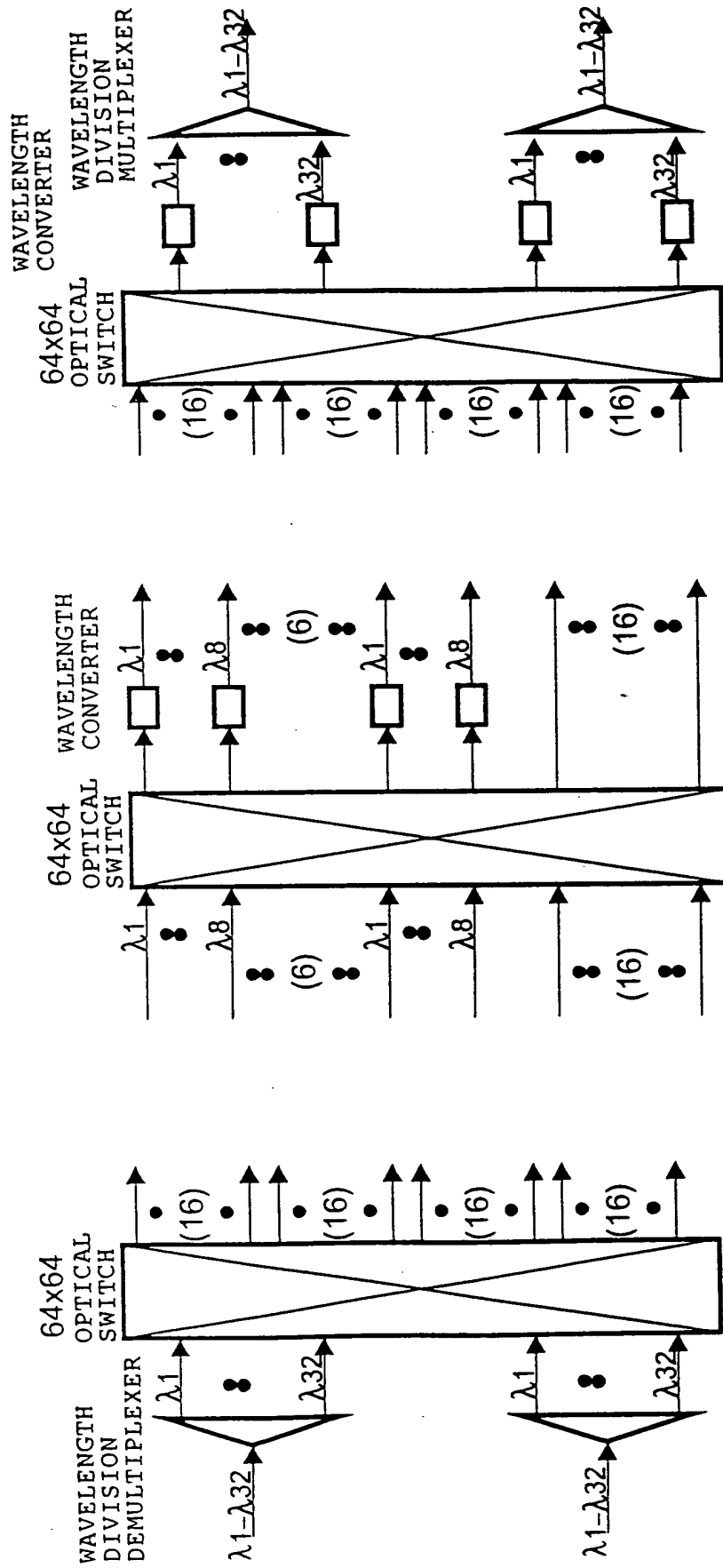※ INTRA-OFFICE OPTICAL SIGNAL CHANNEL NUMBER : 64

FIG. 11

WAVELENGTH COMBINING UNIT

WAVELENGTH BRANCHING UNIT

ROUTING UNIT

INTRA-OFFICE SIGNAL OUTPUT UNIT

INTRA-OFFICE SIGNAL INPUT UNIT

($\lambda 1-\lambda 8$)

($\lambda 9-\lambda 16$)

($\lambda 17-\lambda 24$)

($\lambda 25-\lambda 32$)

$\lambda 1-\lambda 8$
$\lambda 9-\lambda 16$
$\lambda 17-\lambda 24$
$\lambda 25-\lambda 32$
$\lambda 1-\lambda 32$

$\lambda 1-\lambda 8$
$\lambda 9-\lambda 16$
$\lambda 17-\lambda 24$
$\lambda 25-\lambda 32$
$\lambda 1-\lambda 32$

INPUT INTER-OFFICE OPTICAL TRANSMISSION (6) LINES

$\lambda 1-\lambda 32$
$\lambda 1-\lambda 32$
$\lambda 1-\lambda 32$
$\lambda 1-\lambda 32$

$\lambda 1-\lambda 32$
$\lambda 1-\lambda 32$
$\lambda 1-\lambda 32$
$\lambda 1-\lambda 32$

$\lambda 1-\lambda 32$

$\lambda 1-\lambda 32$

INPUT INTER-OFFICE OPTICAL TRANSMISSION (6) LINES

INPUT INTRA-OFFICE OPTICAL TRANSMISSION LINES

$\lambda 1-\lambda 32$
$\lambda 1-\lambda 32$

(16ch)
(16ch)
(16ch)
(16ch)

INTRA-OFFICE SIGNAL INPUT UNIT

(16ch)
(16ch)
(16ch)
(16ch)

$\lambda 1-\lambda 32$

INPUT INTRA-OFFICE OPTICAL TRANSMISSION LINES

$\lambda 1-\lambda 32$

※ SUBDIVIDED BY 4 PIECES OF ROUTING UNITS IN UNIT OF 8 WAVELENGTHS

※ (WAVELENGTH NUMBER : 32)

※ INTER-OFFICE OPTICAL SIGNAL CHANNEL NUMBER : 192

※ INTRA-OFFICE OPTICAL SIGNAL CHANNEL NUMBER : 64

FIG. 12

64x64 OPTICAL SWITCH

$\lambda 0$ ··· (16) ··· (16) ··· (16) ··· (16)

$\lambda 0$

(64)

(a) INTRA-OFFICE SIGNAL
INPUT UNIT

64x64 OPTICAL SWITCH   **WAVELENGTH CONVERTER**

$\lambda 1$ ·· $\lambda 8$ (6) $\lambda 1$ $\lambda 8$ $\lambda 0$ (16) $\lambda 0$

$\lambda 1$ ·· $\lambda 8$ ·· (6) ·· $\lambda 1$ $\lambda 8$ $\lambda 0$ ·· (16) ·· $\lambda 0$

※ ROUTING UNIT FOR $\lambda 1$ TO $\lambda 8$

(b) ROUTING UNIT

64x64 OPTICAL SWITCH

$\lambda 0$ (16) (16) (16) (16)

$\lambda 0$ ··· (64) ··· $\lambda 0$

(c) INTRA-OFFICE SIGNAL
OUTPUT UNIT

FIG. 13

WAVELENGTH
DIVISION
DEMULTIPLEXER

64x64
OPTICAL
SWITCH

$\lambda 1-\lambda 32$

$\lambda 1$ ●● $\lambda 32$

$\lambda 1-\lambda 32$

$\lambda 1$ ●● $\lambda 32$

(16) ● (16) ● (16) ● (16)

(a) INTRA-OFFICE SIGNAL
INPUT UNIT

64x64
OPTICAL
SWITCH

WAVELENGTH
CONVERTER

$\lambda 1$ ●● $\lambda 8$

●● (6) ●●

$\lambda 1$ ●● $\lambda 8$

●● (16) ●●

$\lambda 1$ ●●

$\lambda 8$

●● (6) ●●

$\lambda 1$ ●●

$\lambda 8$

●● (16) ●●

※ROUTING UNIT FOR $\lambda 1$ TO $\lambda 8$

(b) ROUTING UNIT

64x64
OPTICAL
SWITCH

WAVELENGTH
CONVERTER

WAVELENGTH
DIVISION
MULTIPLEXER

$\lambda 1$ ●● $\lambda 32$

$\lambda 1-\lambda 32$

$\lambda 1$ ●● $\lambda 32$

$\lambda 1-\lambda 32$

● (16) ● ● (16) ● ● (16) ● ● (16)

(c) INTRA-OFFICE SIGNAL
OUTPUT UNIT

FIG. 14

WAVELENGTH
DIVISION
DEMULTIPLEXER   64x64 OPTICAL
SWITCH

WAVELENGTH
CONVERTER

WAVELENGTH
DIVISION
MULTIPLEXER

64x64
OPTICAL SWITCH

※ ROUTING UNIT FOR λ1 TO λ8

(a) INTRA-OFFICE SIGNAL
    INPUT UNIT

(b) ROUTING UNIT

(c) INTRA-OFFICE SIGNAL
    OUTPUT UNIT

FIG. 15

WAVELENGTH DIVISION DEMULTIPLEXER

64x64 OPTICAL SWITCH

$\lambda 1$

$\lambda 32$

$\lambda 1-\lambda 32$

$\lambda 1-\lambda 32$

$\lambda 1$

$\lambda 32$

(16)

(16)

(16)

(16)

(a) INTRA-OFFICE SIGNAL INPUT UNIT

WAVELENGTH DIVISION DEMULTIPLEXER

64x64 OPTICAL SWITCH

WAVELENGTH CONVERTER

$\lambda 1$

$\lambda 8$

$\lambda 1-\lambda 32$

$\lambda 1$

$\lambda 8$

$\lambda 1-\lambda 32$

(6)

$\lambda 1$

$\lambda 8$

$\lambda 1-\lambda 8$

$\lambda 1$

$\lambda 8$

$\lambda 1-\lambda 8$

(6)

(16)

(16)

(16)

(16)

※ ROUTING UNIT FOR $\lambda 1$ TO $\lambda 8$

(b) ROUTING UNIT

64x64 OPTICAL SWITCH

WAVELENGTH DIVISION MULTIPLEXER

$\lambda 1$

$\lambda 32$

$\lambda 1-\lambda 32$

$\lambda 1$

$\lambda 32$

$\lambda 1-\lambda 32$

(16)

(16)

(16)

(16)

(c) INTRA-OFFICE SIGNAL OUTPUT UNIT

FIG. 16

SUB-NETWORK #1 $\lambda_1 - \lambda_8$

SUB-NETWORK #4 $\lambda_{25} - \lambda_{32}$

64×64

16

16

16

16

1

64

1

64

(4)

※ THE WAVELENGTHS ARE ALLOCATED IN THE LINK-BY-LINK BASIS IN THE SELECTED SUB-NETWORK BETWEEN THE SENDER AND THE RECEIVER NODES WITH RESPECT TO THE OPTICAL PATH IN THE NETWORK

FIG. 17
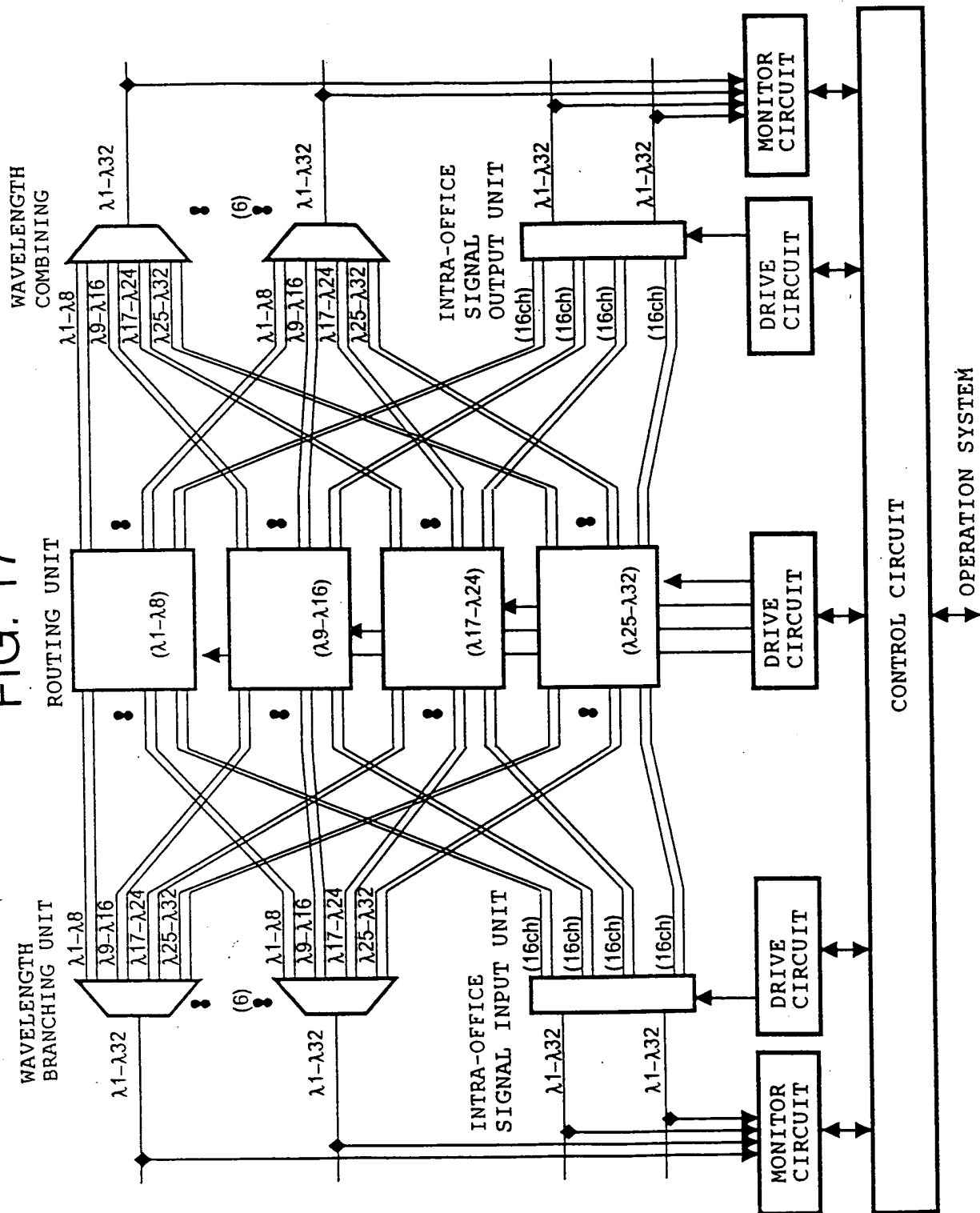
FIG. 18
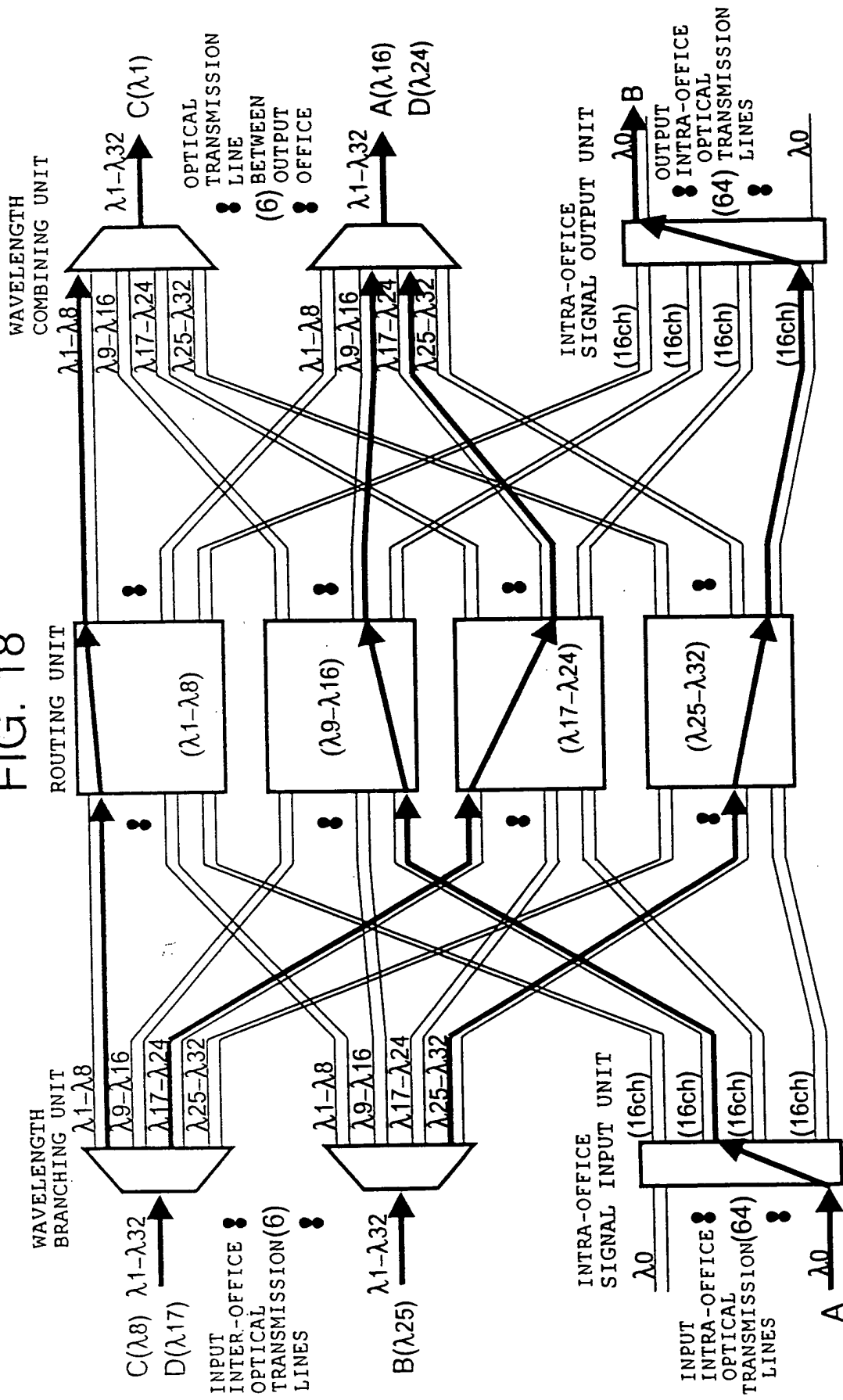
※ SUBDIVIDED BY 4 PIECES OF ROUTING UNITS IN UNIT OF 8 WAVELENGTHS
  (WAVELENGTH NUMBER : 32)
※ INTER-OFFICE OPTICAL SIGNAL CHANNEL NUMBER : 192
※ INTRA-OFFICE OPTICAL SIGNAL CHANNEL NUMBER : 64

FIG. 19
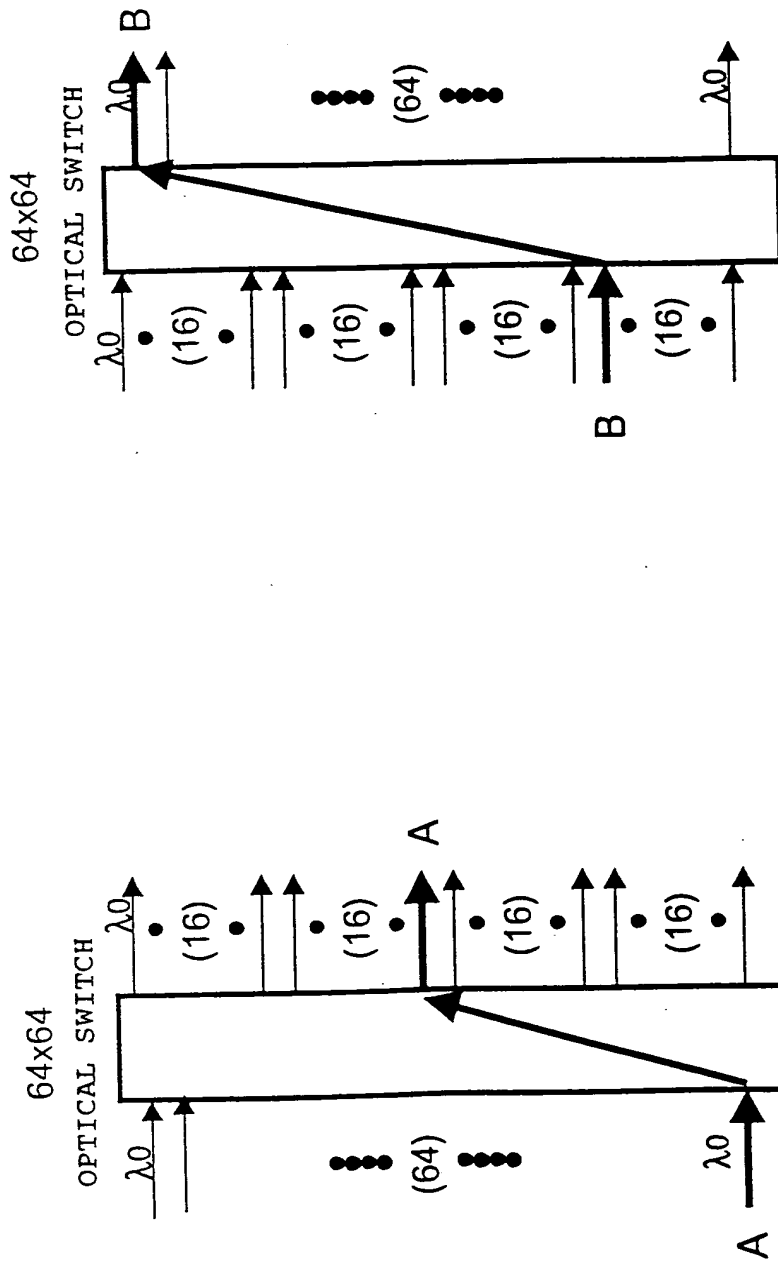
(a) INTRA-OFFICE SIGNAL
   INPUT UNIT
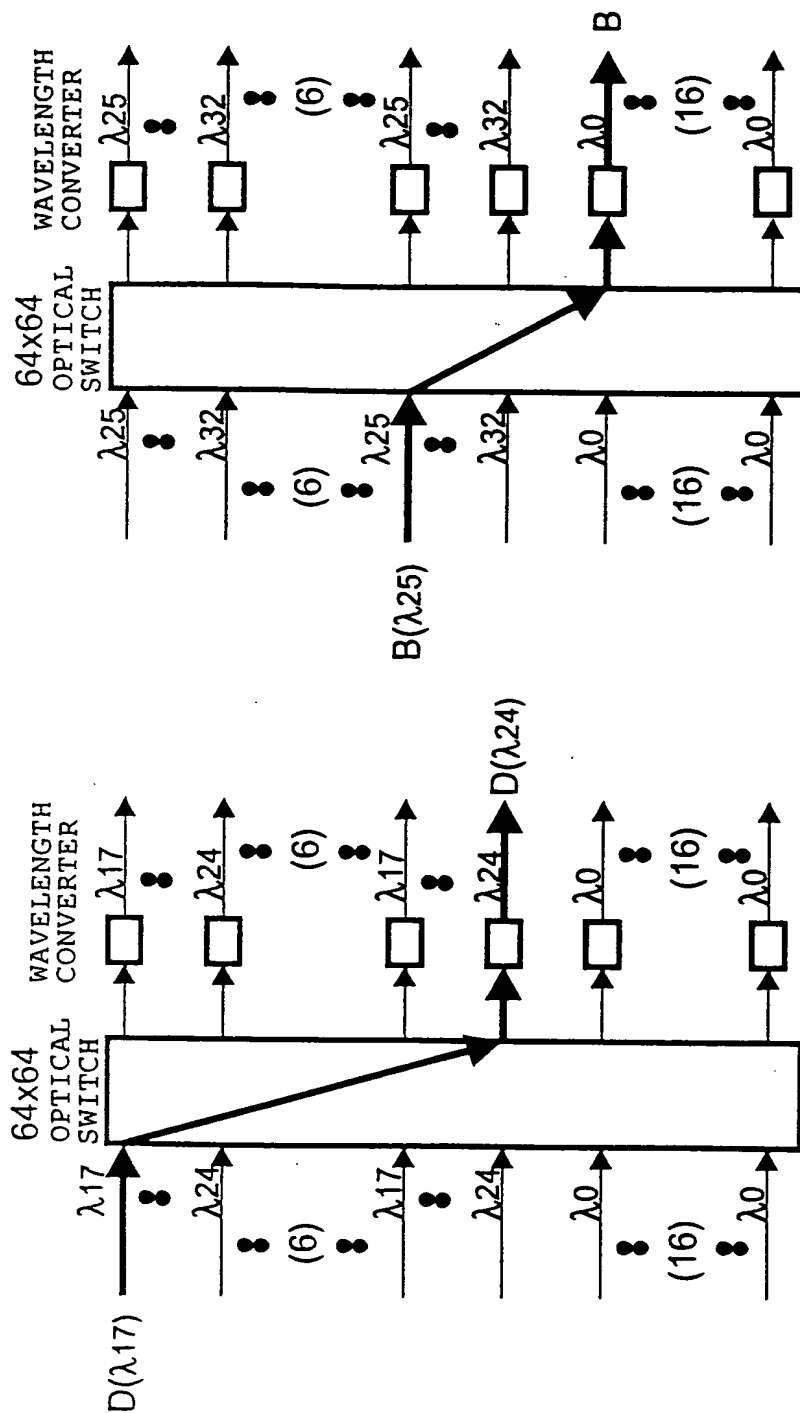
(b) INTRA-OFFICE SIGNAL
   OUTPUT UNIT

FIG. 20
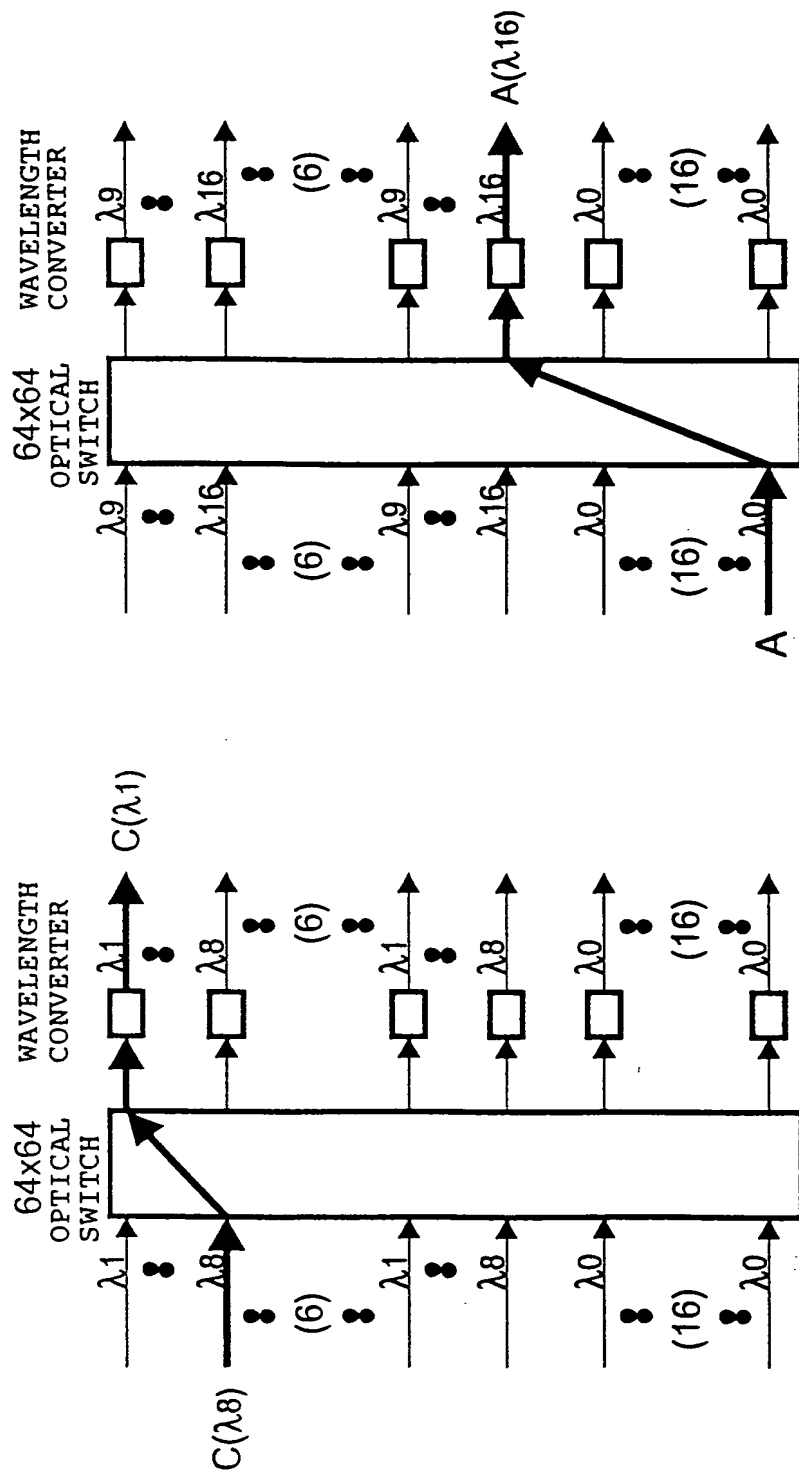
(a) ROUTING UNIT FOR $\lambda 1$ TO $\lambda 8$

(b) ROUTING UNIT FOR $\lambda 9$ TO $\lambda 16$

FIG. 21

(a) ROUTING UNIT FOR λ17 TO λ24

(b) ROUTING UNIT FOR λ25 TO λ32

FIG. 22

Inputs   Outputs

⊗ : Cross   ⊖ : Bar